

REMARKS

Previously added claims 14-26 and newly added claims 27-32 are all the claims presently pending in the application. Claims 1-13 have been previously canceled without prejudice or disclaimer. Claims 14-26 stand rejected on prior art grounds. Claims 14, 20, and 26 are amended herein. Applicants respectfully traverse these rejections based on the following discussion.

IV. The 35 U.S.C. §101 Rejections

Claims 14-26 stand rejected under 35 U.S.C. 101 because, according to the Office Action, the claimed invention lacks patentable practical application. Applicants respectfully traverse these rejections based on the following discussion. Applicants have amended claims 14, 20, and 26 to more particularly describe the usefulness achieved by the claimed invention. In particular, claims 14, 20, and 26 provide, in part, "[means for] assigning accuracy confidence values for each classifier in said decision fusion application based on said greatest value; and [means for] improving a classification accuracy of said decision fusion application based on said accuracy confidence values." Clearly, the claimed language distinctly points out the usefulness achieved by the claimed invention and the practical application for which the claimed invention is used. Specifically, the inventive concept is founded in the recognition that the reliability of a classifier in a decision fusion architecture can vary from sample to sample and from experiment to experiment. The inventive concept involves using the decisions from multiple classifiers in a decision fusion application to make an informed decision as to the classifier which is likely to be correct.

09/839,097

9

More particularly, the inventive concept resides in recognition that a strategy of assigning confidences to different classifiers in a decision fusion architecture can be used to improve the classification accuracy of a decision fusion application. This inventive strategy results in improved classification accuracy as compared to the conventional cases where static confidence measures (or weights) for classifiers are used across samples during the experiment or even across the experiments.

As such, the Applicants assert that the amended claimed language meets the tests of 35 U.S.C. §101 by claiming a beneficial use such as improving the accuracy of classifiers attributable in decision fusion architectures/applications. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw this objection.

II. The Prior Art Rejections

Claims 14, 20 and 26 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Jiang et al. (U.S. Patent No. 6,539,353), hereinafter "Jiang". Claims 15-19 and 21-25 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Jiang et al. in view of Liu (U.S. Patent No. 5,880,767). Applicants respectfully traverse these rejections based on the following discussion.

Jiang teaches a method and apparatus for speech recognition. The method and apparatus convert an analog speech signal into a digital signal and extract at least one feature from the digital signal. A hypothesis word string that consists of sub-word units is identified from the extracted feature. For each identified word, a word confidence measure is determined based on weighted confidence measure scores for each sub-word unit in the word. The weighted

confidence measure scores are created by applying different weights to confidence scores associated with different sub-words of the hypothesis word.

Liu teaches a method and system for enhancing various types of images including photograph, CD, video, and graphic art images. The method of enhancing the input image, includes the steps of: filtering the input image to extract m different frequency components r_k ; adaptively sharpening the m different frequency components r_k , where the amount of sharpening for each component r_k corresponds to a sharpening function $g_k[r_k]$; and adding the adaptively sharpened m different frequency components $g_k[r_k]$ to the input image. Because the sharpening function is typically nonlinear, the step of determining the value of the adaptive frequency component corresponding to the sharpening function is achieved by mapping the filtered component by the corresponding sharpening function.

Ingham teaches a pattern recognition device comprising search means which are controlled initially to make a systematic search of a pattern presented for classification and produce signals descriptive of the features. It also comprises storage means in which are stored (a) a list of likelihoods of classes for given features, (b) a list of likelihoods of features for given classes, and (c) a list of mean distances between features for given classes. These lists may be built up during a self-organizing mode of operation of the device. The device further includes prediction means which, when a given number of features have been described by the search means, utilizes these features and the lists in the storage means and predicts the most likely class of the presented pattern, another feature likely to be associated with the features already described, and the locality of said feature. The control of the search means is then passed to the prediction means which cause a search to be carried out in the predicted locality. A signal

produced as the result of the search in the predicted locality may be used either in a further prediction or to cause the systematic search to be resumed.

In view of the amended claims, neither Jiang nor Liu teaches, "...determining a manner of classifying a data sample in one of a number of predetermined classes,...comprising: associating data classifiers in a decision fusion application comprising said data sample, wherein said classifiers indicate a manner of classifying said sample in said one of a number of predetermined classes; computing a weight value for each of a plurality of classifiers; calculating for each of said predetermined classes a weighted summation across said classifiers of a likelihood that the sample belongs to a particular class, weighted by said weight value; designating said sample as belonging to said particular class for which said weighted summation is greatest in value; assigning accuracy confidence values for each classifier in said decision fusion application based on said greatest value; and improving a classification accuracy of said decision fusion application based on said accuracy confidence values" as provided by the amended independent claim 14, and similarly claimed in amended independent claims 20 and 26.

In particular, the Office Action admits that Jiang does not disclose determining if the weighted summation of likelihoods is greatest in value. True, Jiang does not teach this. However, the claimed invention goes beyond this to provide, "designating said sample as belonging to said particular class for which said weighted summation is greatest in value." This means that the claimed invention not only compares the weighted summation against a threshold, but also uses this information to assign confidence values associated with a particular classifier in order to improve the classification accuracy of the particular decision fusion application, such as an audiovisual speech recognition application. Rather, Jiang merely takes its confidence

measures and either indicates whether a particular word is identified as likely being correct (see col. 6, lines 38-46). Furthermore, Jiang outputs its confidence measures such that a user may have the ability to restate his/her utterance given that his/her first utterance was incorrect. However, this does nothing to improve the classification accuracy of the application. This merely improves the accuracy of the speech recognized by the system/model in Jiang. The Office Action suggests that Ingham teaches developing a confidence level for a plurality of likelihoods and indicating the class with the greatest confidence level above a threshold. However, Ingham does not describe determining a weighted summation across multiple classifiers, and determining which weighted summation is greatest in value. Rather, Ingham merely describes applying a signal to open a gate when the highest confidence level is generated (col. 5, lines 58-61). These are clearly directed to two separate and wholly unique solutions.

Thus, in view of the foregoing, Applicants assert that it would not be obvious to one having ordinary skill in the art to incorporate the step of "designating said sample as belonging to said particular class for which said weighted summation is greatest in value" with the other steps of the claimed invention. This is so because the invention aims to solve a problem wholly unique to either Jiang or Liu or the other prior art of record; that is improving the classification accuracy of a decision fusion application. Again, Jiang does not improve the classification accuracy of a decision fusion application. Rather, Jiang only aims to accurately recognize words from an input digital speech signal. Regardless of the assertion in the Office Action of what Jiang supposedly teaches with regard to its confidence measure, the Applicants reiterate that the weights used by Jiang are kept constant during the experiment in Jiang. There is no technique mentioned as to how these weights can be determined during the experiment, which the claimed

invention does with regard to the "weight value for a classifier comprises a sample confidence component, wherein said sample confidence component includes a linear combination of an order statistic." In fact, determining these weights during the experiment allows one the ability to adapt the weight from sample to sample in the experiment.

Similarly, Liu does not improve the classification accuracy of a decision fusion application. Rather, Liu only aims to improve or sharpen an input image. Again, Liu is not related to the claimed invention at all, or decision fusion in general, as the image pixel values are something inherent to the input data while in a decision fusion experiment the order statistic is of the outcomes of the classifiers after their application on the data. Moreover, from just the input data (without any processing on it), no information can be extracted about the confidence of a classifier.

Insofar as references may be combined to teach a particular invention, and the proposed combination of Jiang with Liu and an attempted combination of Jiang with Ingham, case law establishes that, before any prior-art references may be validly combined for use in a prior-art 35 U.S.C. § 103(a) rejection, the individual references themselves or corresponding prior art must suggest that they be combined.

For example, in In re Sernaker, 217 U.S.P.Q. 1, 6 (C.A.F.C. 1983), the court stated: "[P]rior art references in combination do not make an invention obvious unless something in the prior art references would suggest the advantage to be derived from combining their teachings." Furthermore, the court in Uniroyal, Inc. v. Rudkin-Wiley Corp., 5 U.S.P.Q.2d 1434 (C.A.F.C. 1988), stated, "[w]here prior-art references require selective combination by the court to render obvious a subsequent invention, there must be some reason for the combination other than the

hindsight gleaned from the invention itself. . . . Something in the prior art must suggest the desirability and thus the obviousness of making the combination."

In the present application, the reason given to support the proposed combination is improper, and is not sufficient to selectively and gratuitously substitute parts of one reference for a part of another reference in order to try to meet, but failing nonetheless, the Applicant's novel claimed invention. Furthermore, the claimed invention, as amended, meets the above-cited tests for obviousness by including embodiments such as assigning accuracy confidence values for each classifier in a decision fusion application based on the greatest value attributed to a weighted summation across a plurality of classifiers of a data sample. Additionally, none of the prior art references of record describe the improving the classification accuracy of the decision fusion application based on the assigned accuracy confidences. As such, all of the claims of this application are, therefore, clearly in condition for allowance, and it is respectfully requested that the Examiner pass these claims to allowance and issue.

As declared by the Federal Circuit:

In proceedings before the U.S. Patent and Trademark Office, the Examiner bears the burden of establishing a prima facie case of obviousness based upon the prior art. The Examiner can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. In re Fritch, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992) citing In re Fine, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988).

Here, the Examiner has not met the burden of establishing a prima facie case of obviousness. It is clear that, not only does Jiang individually fail to disclose all of the elements of the claims of the present invention, particularly, the classification accuracy improvements as discussed above, but also, if combined with either Liu or Ingham or if modified in the manner

09/839,097

15

proposed in the Office Action, respectively, fails to disclose these elements as well. The unique elements of the claimed invention are clearly an advance over the prior art.

The Federal Circuit also went on to state:

The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. . . . Here the Examiner relied upon hindsight to arrive at the determination of obviousness. It is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has previously stated that one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. Fritch at 1784-85, citing In re Gordon, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

Here, there is no suggestion that Jiang, alone or in combination with Liu or Ingham or with supposedly well-known elements not taught in any of the cited prior art, respectively, teaches a method and apparatus containing all of the limitations of the claimed invention. Consequently, there is absent the "suggestion" or "objective teaching" that would have to be made before there could be established the legally requisite "prima facie case of obviousness."

Furthermore, even if Jiang were to be combined with Liu or Ingham, or modified in the manner proposed by the Office Action, respectively, they would still fail to teach the novel aspects of the invention, in particular the novel way of determining relative confidence of a classifier in a decision fusion experiment example, and how this measure of confidence can be adapted for every given sample in the example. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw these rejections.

III. Formal Matters and Conclusion


The Applicants respectfully submit that independent claims 14, 20, and 26 are patentable over the prior art of record. Furthermore, dependent claims 15-19, 21-25, and 27-32 are similarly patentable, not only by virtue of their dependency from a patentable independent claim, but also by virtue of the additional features of the invention they define.

In view of the foregoing, Applicants submit that claims 14-32, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 09-0441.

Respectfully submitted,

Dated: April 19, 2004



Mohammad S. Rahman
Reg. No. 43,029
McGinn & Gibb, P.L.L.C.
2568-A Riva Road, Suite 304
Annapolis, MD 21401
Voice: (301) 261-8625
Fax: (301) 261-8825
Customer Number: 29154